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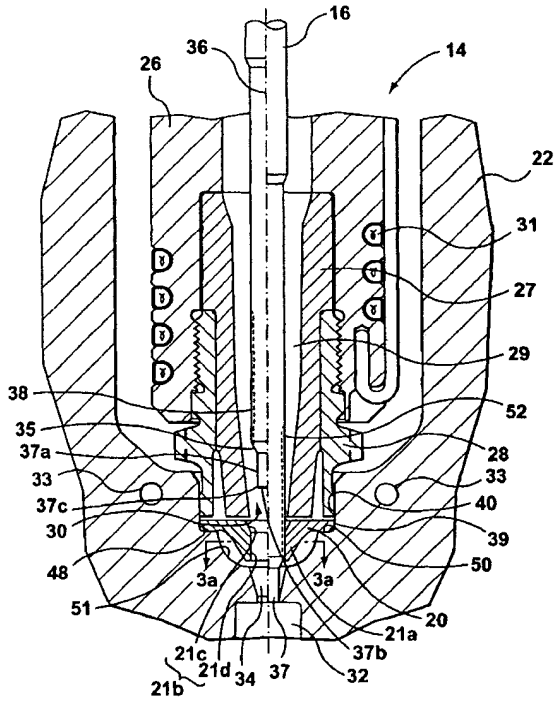
(54) GUIDE POUR GOUPILLE DE SOUPAPE DESTINE A UNE BUSE A SOUPAPE D'OBTURATION
(54) A VALVE PIN GUIDE FOR A VALVE-GATED NOZZLE

(57)

A valve pin guide (20) is provided for guiding a valve pin (16) from a nozzle (14) into a gate of a mold cavity (32) in an injection molding apparatus (10) . The valve pin guide (20) defines a guide aperture (21b) therethrough. The guide aperture (21b) is adapted to receive and guide the valve pin(16) into alignment with the gate (34). The valve pin guide (20) is positioned downstream from said nozzle (14) and upstream from said gate (34).



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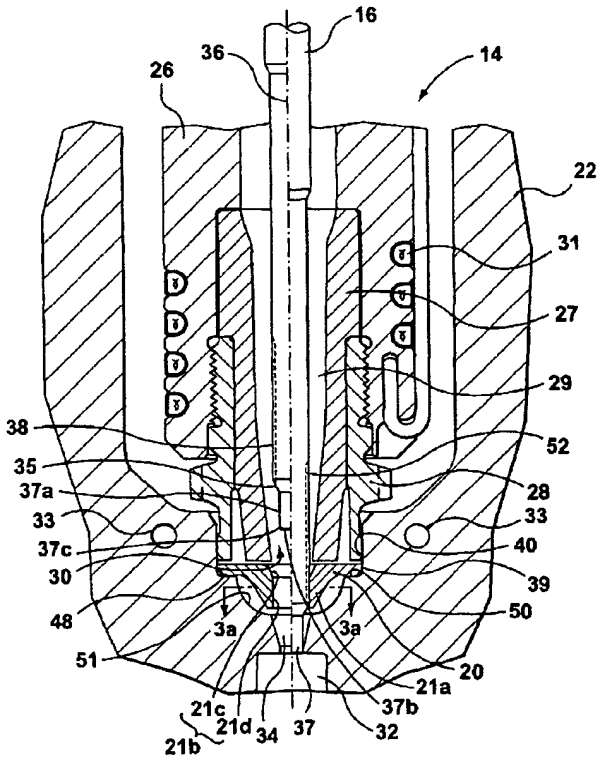
(54) Title: A VALVE PIN GUIDE FOR A VALVE-GATED NOZZLE



(57) Abrégé/Abstract:
A valve pin guide (20) is provided for guiding a valve pin (16) from a nozzle (14) into a gate of a mold cavity (32) in an injection molding apparatus (10). The valve pin guide (20) defines a guide aperture (21b) therethrough. The guide aperture (21b) is adapted to receive and guide the valve pin(16) into alignment with the gate (34). The valve pin guide (20) is positioned downstream from said nozzle (14) and upstream from said gate (34).

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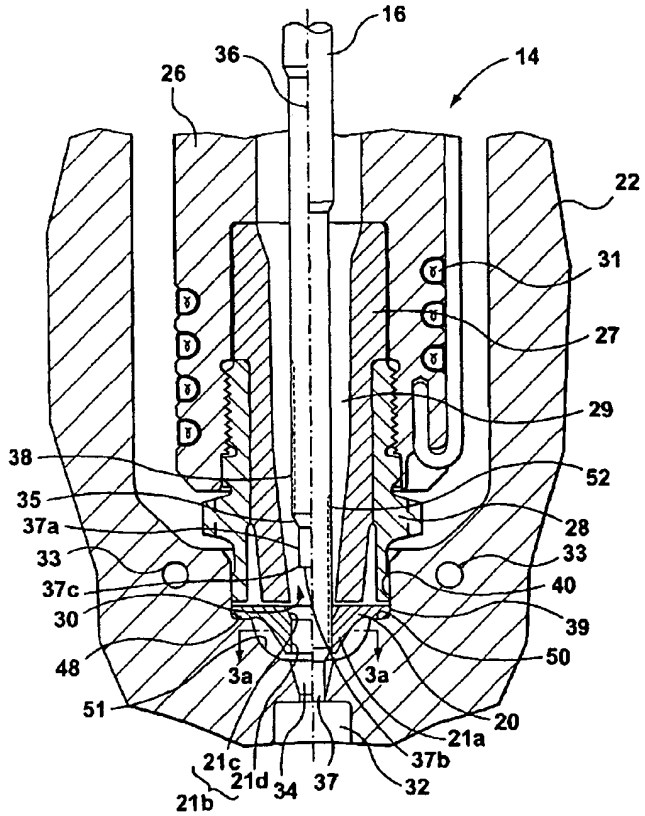
(54) Title: A VALVE PIN GUIDE FOR A VALVE-GATED NOZZLE



(57) Abstract: A valve pin guide (20) is provided for guiding a valve pin (16) from a nozzle (14) into a gate of a mold cavity (32) in an injection molding apparatus (10). The valve pin guide (20) defines a guide aperture (21b) therethrough. The guide aperture (21b) is adapted to receive and guide the valve pin(16) into alignment with the gate (34). The valve pin guide (20) is positioned downstream from said nozzle (14) and upstream from said gate (34).

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Title: A VALVE PIN GUIDE FOR A VALVE-GATED NOZZLE

Field of the invention

[0001] This invention relates to an injection molding apparatus, and more particularly to a guide for a valve pin in a valve-gated nozzle.

Background of the invention

[0002] It is known for a nozzle in hot runner injection molding apparatuss to include a valve pin gating mechanism at each gate into each mold cavity. The valve pin is typically moved in a melt channel of the nozzle towards or away from the gate, to control the flow of melt into the melt cavity. In order to provide a good seal at the gate, both the tip portion of the valve pin and the corresponding sealing surface on the gate must typically be machined to very close tolerances.

Due to a variety of reasons, however, the tip of the valve pin may be misaligned with the gate as it enters the gate. For example, the nozzle in which the valve pin moves may be misaligned with the gate. Also, thermal expansion and contraction of the components of the injection molding machine, which takes place repeatedly during an injection molding campaign can cause components to shift, ultimately resulting in misalignment of the nozzle and valve pin with the gate. Non-homogeneity in the melt itself can cause the melt to exert uneven fluid pressure on the valve pin body, which can push the sealing end of the valve pin out of alignment with the gate.

[0003] When a misaligned valve pin is moved to close a gate, the valve pin collides with the gate and can cause scoring of the sealing surfaces on the valve pin and/or the gate. This can ultimately result in poor quality parts with blemishes around the gate, and can cause other problems with the molding operation. Furthermore, a damaged valve pin or gate can be expensive and time consuming to replace. The damage may happen immediately, or alternatively it may happen gradually, over many cycles of opening and closing the valve pin.

[0004] Solutions that have been proposed for this problem, have typically included a guide means positioned towards the bottom of the nozzle

melt channel to capture and align the free end of the valve pin. Because melt is required to flow past the alignment means / valve pin interface when the valve pin is in the open position, a plurality of circumferentially spaced slots are typically provided in either the valve pin or the alignment means. In doing so, these slots create the potential for weld lines to appear in the molded product, as a result of the melt flow in the nozzle melt channel separating to pass around the guide means, and subsequently reuniting downstream from the guide means. Furthermore, the presence of such guide means in the nozzle melt channel typically renders more difficult a cleanout of the nozzle melt channel, hampering for example the changeover of a machine to run a new melt.

[0005] Other solutions have provided an offset nozzle melt channel which has a main portion that is offset from the center of the nozzle, and a lowermost portion that is aligned with the gate. The valve pin passes through the nozzle body and extends only into the lowermost portion of the nozzle melt channel. In this way, the valve pin is captured along a substantial portion of its length, which makes it less susceptible to misalignment. However, because a substantial portion of the nozzle melt channel is offset from the center of the nozzle, the heat distributed to the melt flowing therethrough is uneven, which can cause difficulties in controlling melt temperature. Reference is made to US Patent Nos. 5,834,041 (Sekine et al) and 5,895,669 (Seres, Jr et al), which disclose embodiments of this genre of proposed solution.

[0006] Other problems also exist, which originate from the manufacture of the nozzles themselves instead from the properties of the melt flow. Manufacturing errors may exist in the nozzles, which can introduce a misalignment between the valve pin and the gate that is 'built-in'. The guide means that are described above, which are built into the nozzle itself, do nothing to correct this particular cause of misalignment.

[0007] Thus, a need exists for a nozzle having an improved guide for guiding the valve pin into the gate.

Summary of the invention

[0008] In a first aspect the invention is directed to a valve pin guide for guiding a valve pin from a nozzle into a gate of a mold cavity in an injection molding apparatus. The valve pin guide defines a guide aperture therethrough. The guide aperture is adapted to receive and guide the valve pin into alignment with the gate. The valve pin guide is positioned downstream from said nozzle and upstream from said gate.

[0009] In a second aspect, the invention is directed to an injection molding apparatus that incorporates at least one of the valve pin guide described above.

[0010] In a third aspect, the invention is directed to an injection molding apparatus. The injection molding apparatus includes a mold cavity block, an injection nozzle, a valve pin and a valve pin guide. The mold cavity block defines a mold cavity therein. The mold cavity has a gate. The mold cavity block has a first bore and a second bore. The gate is positioned in the second bore. The first bore is larger in diameter than the second bore. A melt channel is defined in the injection nozzle to convey melt towards the gate. The valve pin is positioned at least partially in the melt channel and is movable to control melt flow into the gate. The valve pin guide is adapted to receive and guide the valve pin into alignment with the gate. The valve pin guide is positioned in the first bore.

Brief description of the drawings

[0011] Reference will now be made by way of example to the accompanying drawings, showing articles made according to preferred embodiments of the present invention, in which:

[0012] Figure 1 is a sectional view of an injection molding apparatus having a plurality of valve-gated nozzles and a plurality of valve pin guides in accordance with a first embodiment of the present invention;

[0013] Figure 2 is a sectional side view of one of the nozzles shown in Figure 1;

[0014] Figures 2a, 2b, 2c and 2d are magnified sectional side views of a valve pin guide shown in Figure 2 aligning a valve pin entering a gate;

[0015] Figure 2e is a magnified sectional side view of the valve pin guide and a bore in the mold cavity block shown in Figure 2;

[0016] Figure 3a is a cross-section view of a plurality of cutouts that are optionally included on a portion of the valve pin shown in Figure 2;

[0017] Figure 3b is a cross-sectional view of a plurality of cutouts that are optionally included on the valve pin guide shown in Figure 2;

[0018] Figure 3c is a cross-sectional view of a plurality of cutouts that are optionally included on the tip of the nozzle shown in Figure 2;

[0019] Figure 4 is a sectional side view of a valve pin guide in accordance with another embodiment of the present invention;

[0020] Figure 4a is a sectional side view of a variant of the valve pin guide shown in Figure 4;

[0021] Figure 5 is a sectional side view of a combination of the valve pin guide shown in Figure 2, with a variant of the nozzle shown in Figure 2, in accordance with yet another embodiment of the present invention;

[0022] Figure 6 is a sectional side view of a combination of the valve pin guide shown in Figure 2, with another variant of the nozzle shown in Figure 2, in accordance with yet another embodiment of the present invention;

[0023] Figure 7 is a sectional side view of a combination of the valve pin guide shown in Figure 2 with yet another variant of the nozzle shown in Figure 2, in accordance with yet another embodiment of the present invention;

[0024] Figure 8 is a sectional side view of a combination of the valve pin guide shown in Figure 2 with yet another variant of the nozzle shown in Figure 2, in accordance with yet another embodiment of the present invention;

[0025] Figure 9 is a sectional side view of a combination of the valve pin guide shown in Figure 2 with yet another variant of the nozzle shown in Figure 2, in accordance with yet another embodiment of the present invention;